Parkrun analytics

University College London

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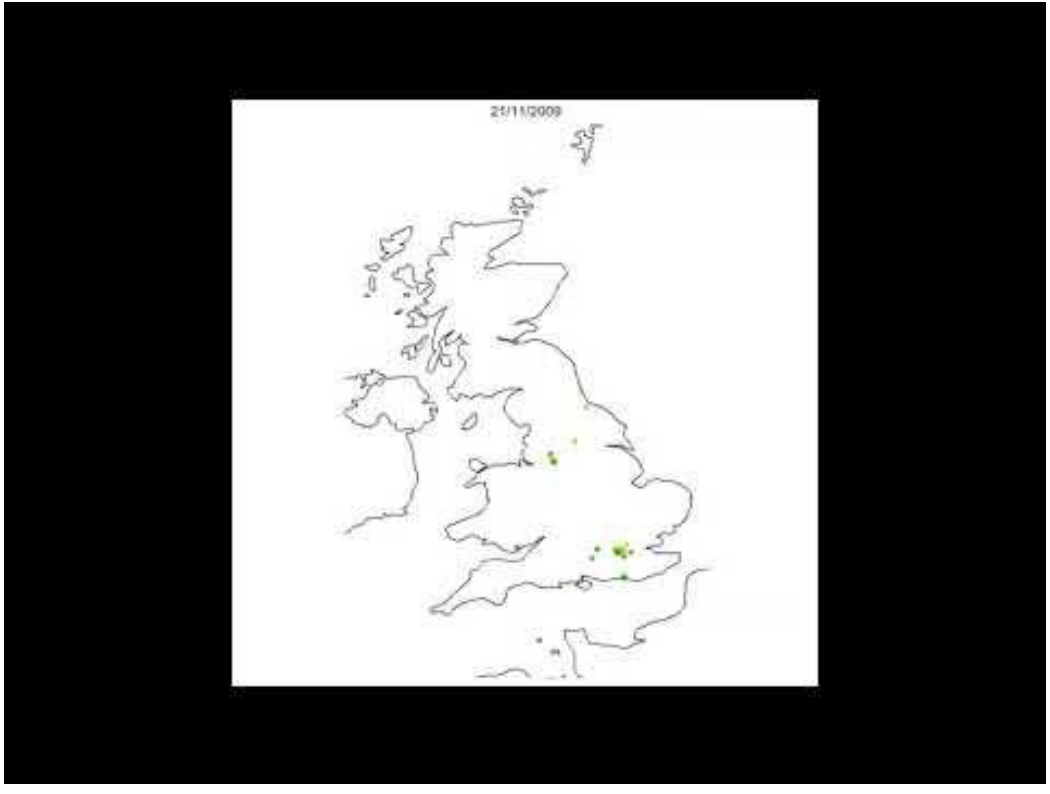
Robert Smith

rasmith3@sheffield.ac.uk

https://github.com/RobertASmith

1) School of Health & Related Research, University of Sheffield
2) Dark Peak Analytics Ltd
3) Lumanity Ltd

Background



https://www.youtube.com/watch?v=ktx4lujARdc&feature=share

Background

PARTNERSHIP WITH PARKRUN WORTH £3M

Collaboration aims to create 200 new events and boost participants from under-represented groups

12 December 2018 News Funding

Research Questions

Where should parkrun locate 200 new parkrun events?

	Access	Participation
Efficiency	1. Maximize overall access.	3. Maximize overall participation.
Equity	2. Maximize deprivation weighted access.	4. Maximize deprivation weighted participation.

Methods

More formally, we define that for any candidate green space location j, the objective function $f(j|E)$ provides the sum of parkrun runs r_i over all LSOA i, weighted by the squared IMD score w_i^2, given the set of established parkrun event locations $E = \{e_1, e_2, ..., e_{455}\}$:

$$f(j|E) = \sum_{i=1}^{32844} w_i^2 * r_{ij}$$

In the absence of causal estimates, we use the Poisson regression model specified above to predict the expected number of runs r_{ij} for LSOA i based on its IMD score w_i, its (linear) distance to the nearest parkrun event d_{ij}, and its population p_i. The functional form is given below.

$$E(r_{ij}|w_i, d_{ij}, p_i) = \exp(\beta_0 + \beta_1 * w_i + \beta_2 * d_{ij} + \ln(p_i) + \in)$$

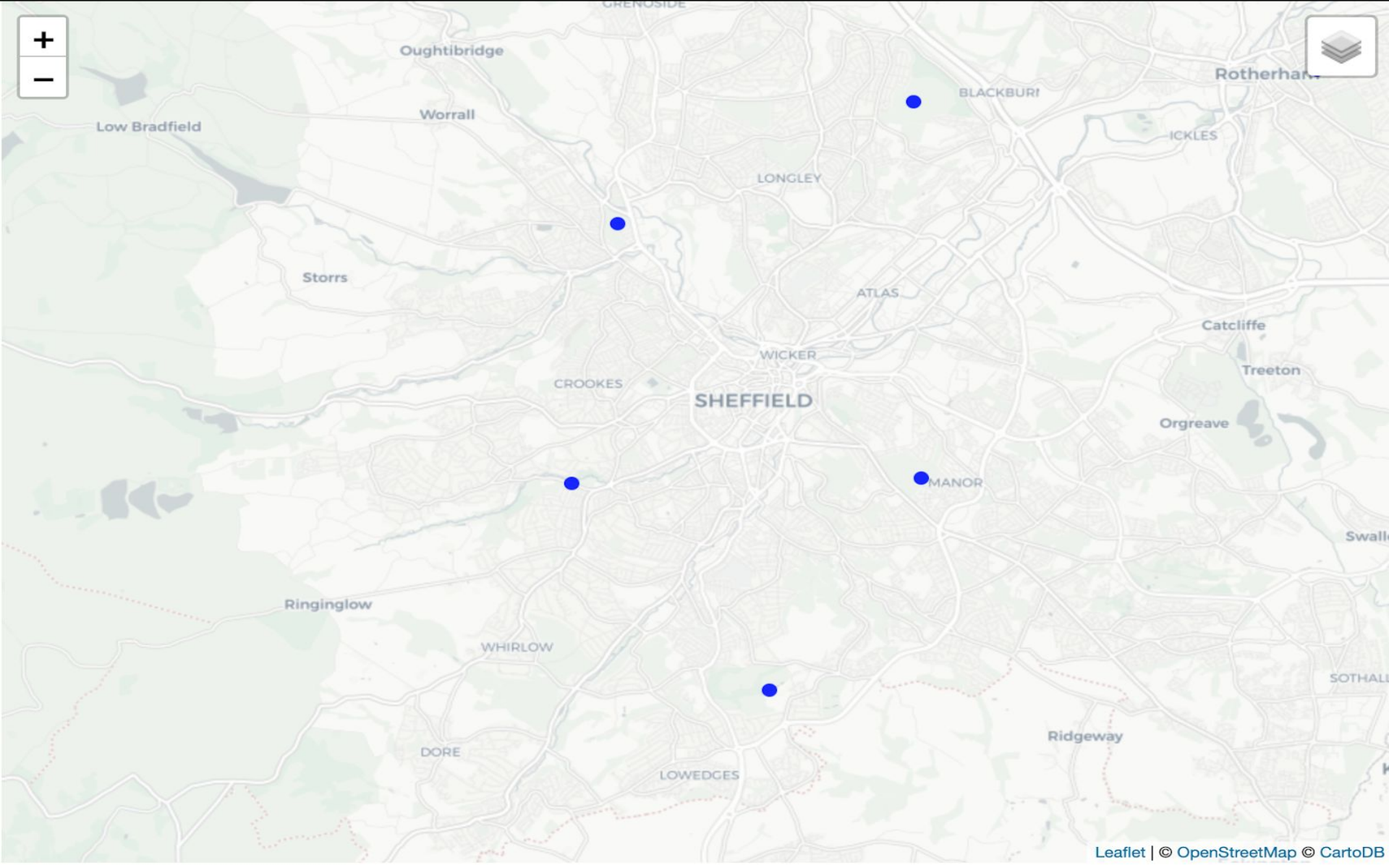
Filling-in the parameter coefficients (see table 3), we derive the following formula:

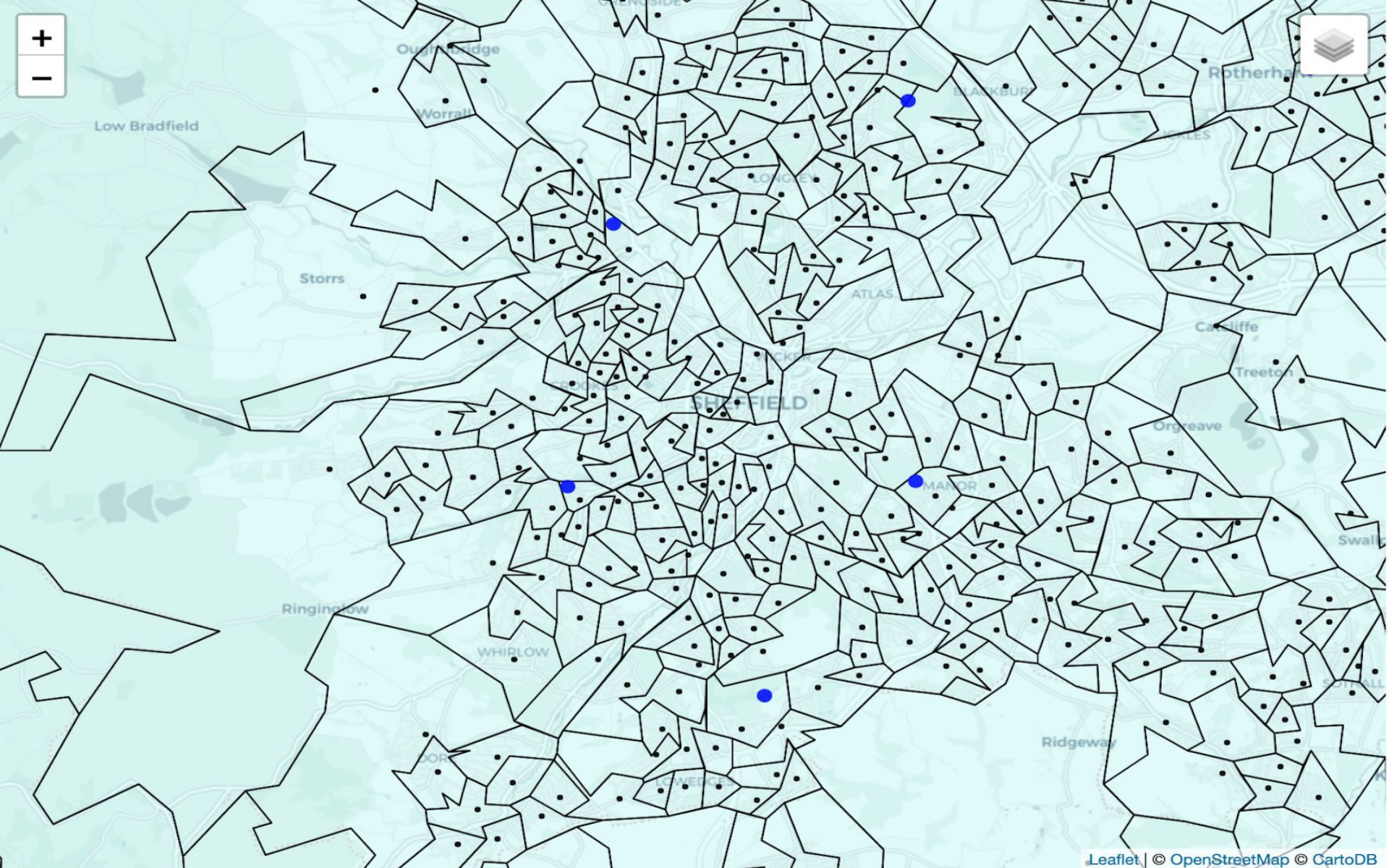
$$\hat{r_{ij}} = \exp(-5.402 - 0.048 * w_i - 0.082 * d_{ij} + \ln(p_i))$$

Note that j can have an effect on r_{ij} through d_{ij}: setting up a new event at location j will reduce the distance to the nearest event for some LSOA i. This means, we evaluate the distances from LSOA is location l_i to all established parkrun event locations $\{e_1, e_2, ..., e_{455}\} \in E$, denoted $\overline{l_i e_1}, \overline{l_i e_2}, \ldots, \overline{l_i e_{455}}$, and to the candidate green space location j, denoted $\overline{l_i j}$, and then take the minimum value, i.e. $d_{ij} = \min(\overline{l_i j}, \overline{l_i e_1}, \overline{l_i e_2}, \ldots, \overline{l_i e_{455}})$.

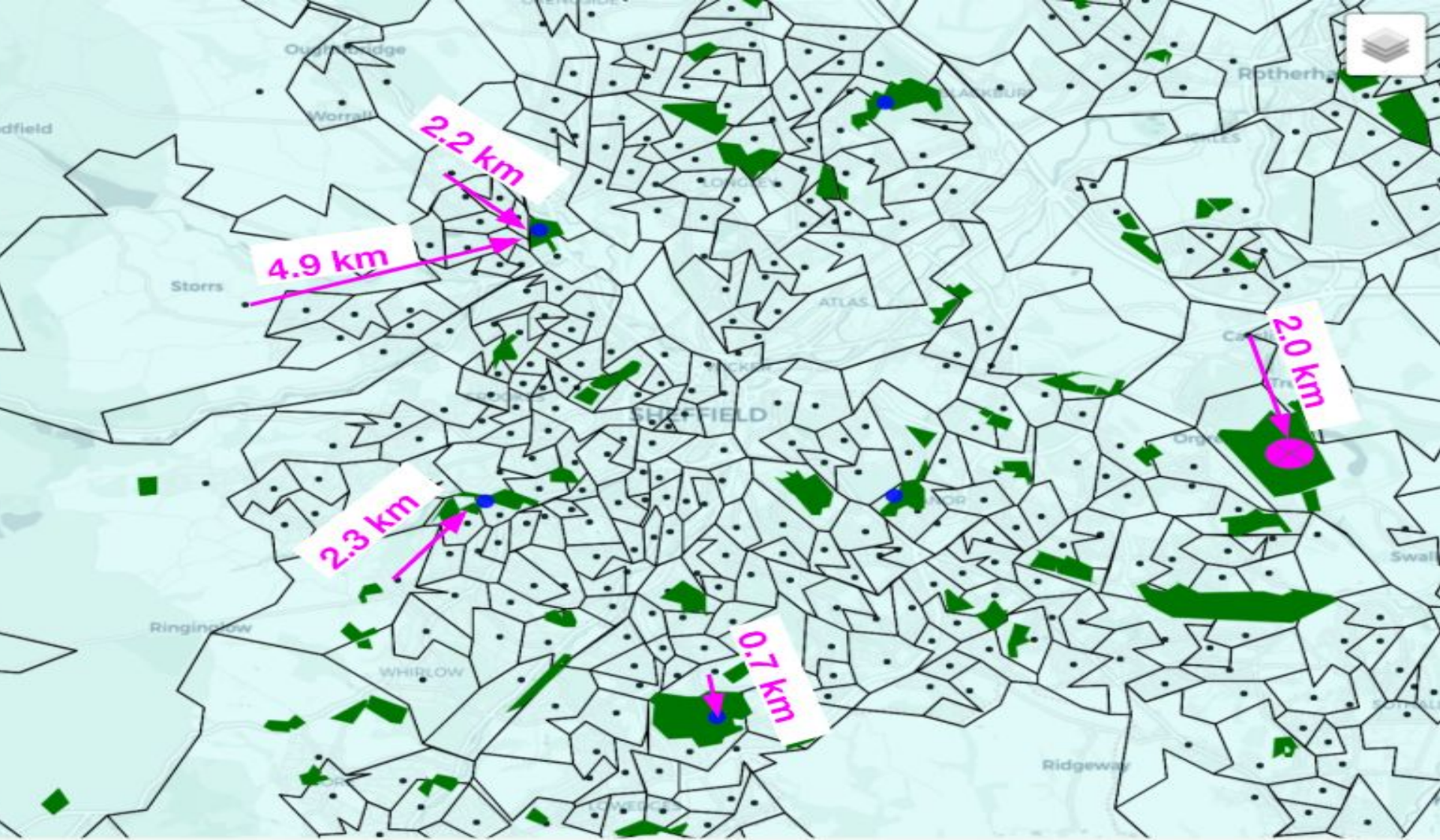
The expected change in the objective function is computed for all candidate locations j in the set of the available green spaces $C = \{c_1, c_2, \ldots, c_{2842}\}$, and the location with the maximum value is selected. The selection function is expressed in the following formula:

$$\arg\max_{j \in C} f(j|E)$$


Oughtibridge
Worrall
Low Bradfield
Storrs
LONGLEY
ATLAS
WICKER
CROOKES
SHEFFIELD
BLACKBURN
ICKLES
Catcliffe
Treeton
Orgreave
MANOR
Ringinglow
WHIRLOW
DORE
LOWEDGES
Ridgeway
Leaflet | © OpenStreetMap © CartoDB

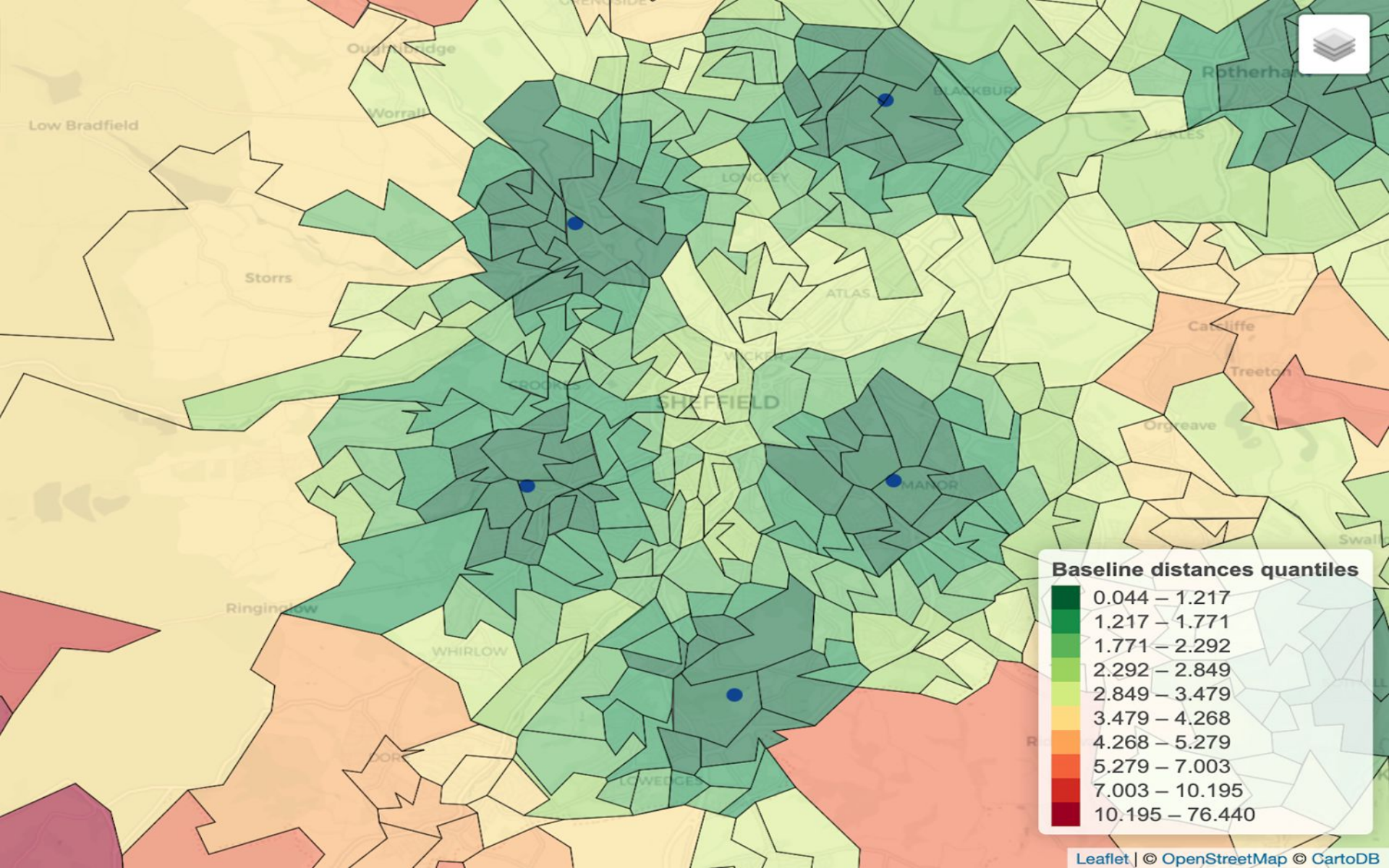

Low Bradfield
Storrs
Ringinglow
WHIRLOW
Ridgeway
Leaflet | © OpenStreetMap © CartoDB

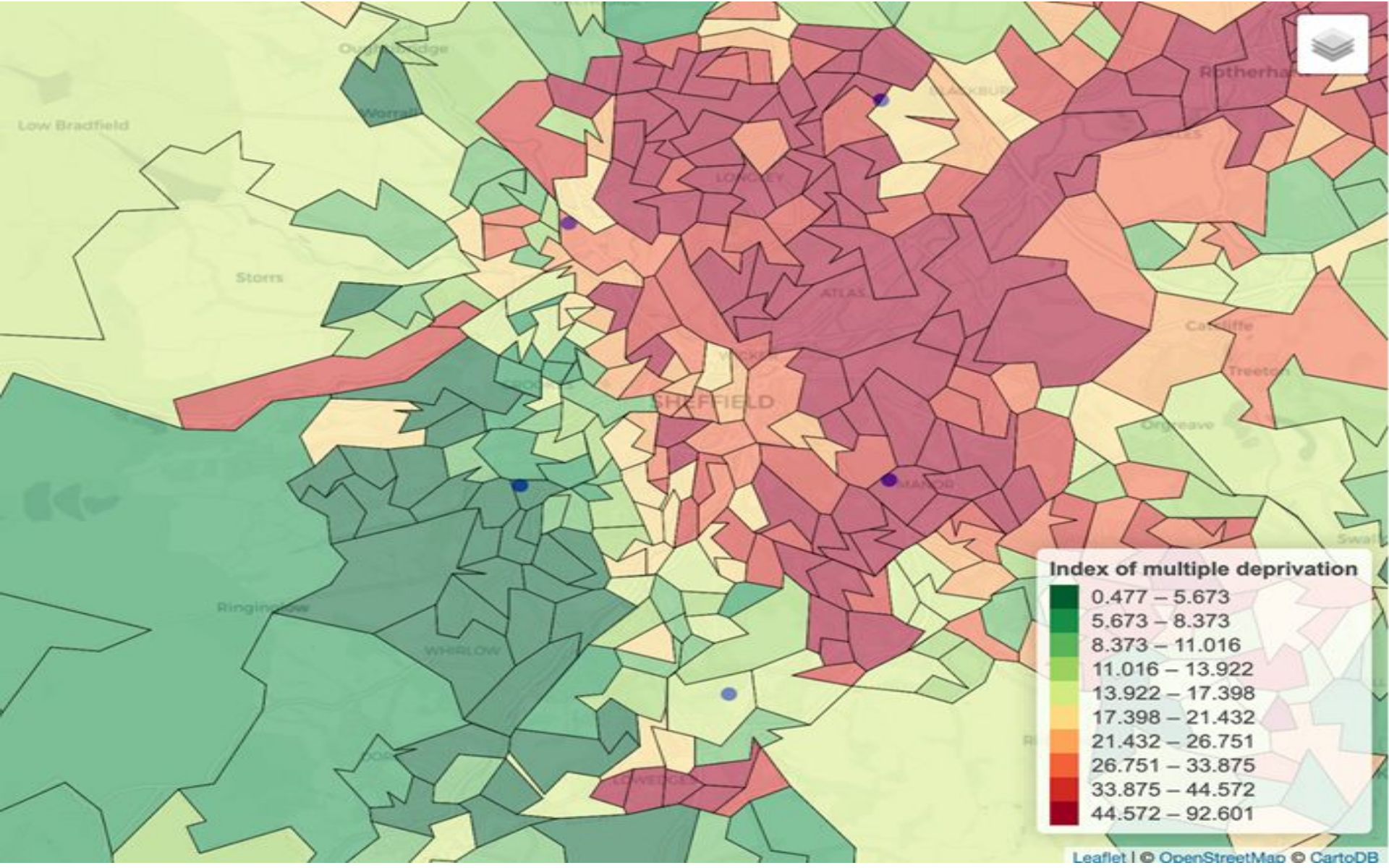
Access = { 2.2 * 1,220 + 4.9 * 2,351+ 2.3*1,915 + 0.7 * 1,844 + 5.1 * 1,530 } = <u>27,702.2</u>

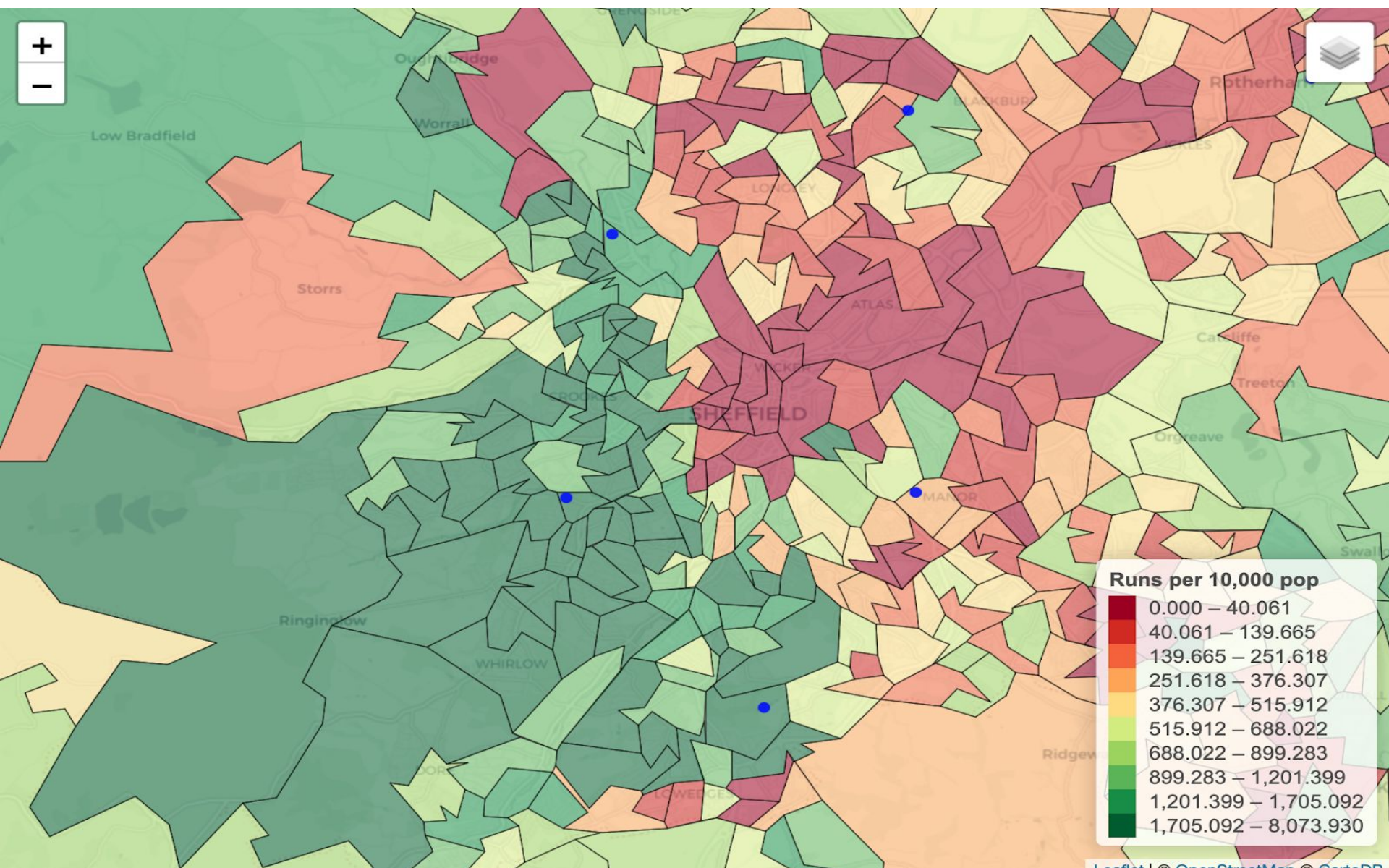


Access = { 2.2 * 1,220 + 4.9 * 2,351+ 2.3*1,915 + 0.7 * 1,844 + 2.0 * 1,530 } = 22,959.2

Results

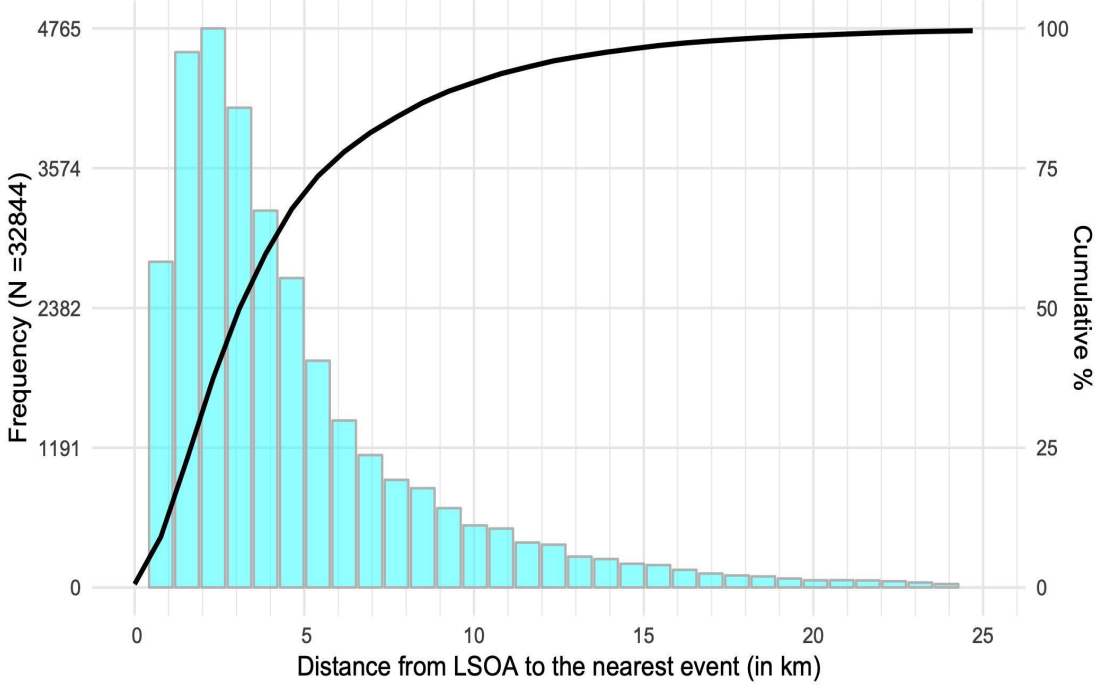

Baseline distances quantiles
0.044 – 1.217
1.217 – 1.771
1.771 – 2.292
2.292 – 2.849
2.849 – 3.479
3.479 – 4.268
4.268 – 5.279
5.279 – 7.003
7.003 – 10.195
10.195 – 76.440
Leaflet | © OpenStreetMap © CartoDB


Low Bradfield
Storrs
SHEFFIELD
Index of multiple deprivation
0.477 – 5.673
5.673 – 8.373
8.373 – 11.016
11.016 – 13.922
13.922 – 17.398
17.398 – 21.432
21.432 – 26.751
26.751 – 33.875
33.875 – 44.572
44.572 – 92.601
Leaflet | © OpenStreetMap © CartoDB


Runs per 10,000 pop
0.000 – 40.061
40.061 – 139.665
139.665 – 251.618
251.618 – 376.307
376.307 – 515.912
515.912 – 688.022
688.022 – 899.283
899.283 – 1,201.399
1,201.399 – 1,705.092
1,705.092 – 8,073.930
Low Bradfield
Storrs
Ringinglow
WHIRLOW
Rotherham
Treeton
Orgreave
Ridgew
Leaflet | © OpenStreetMap © CartoDB

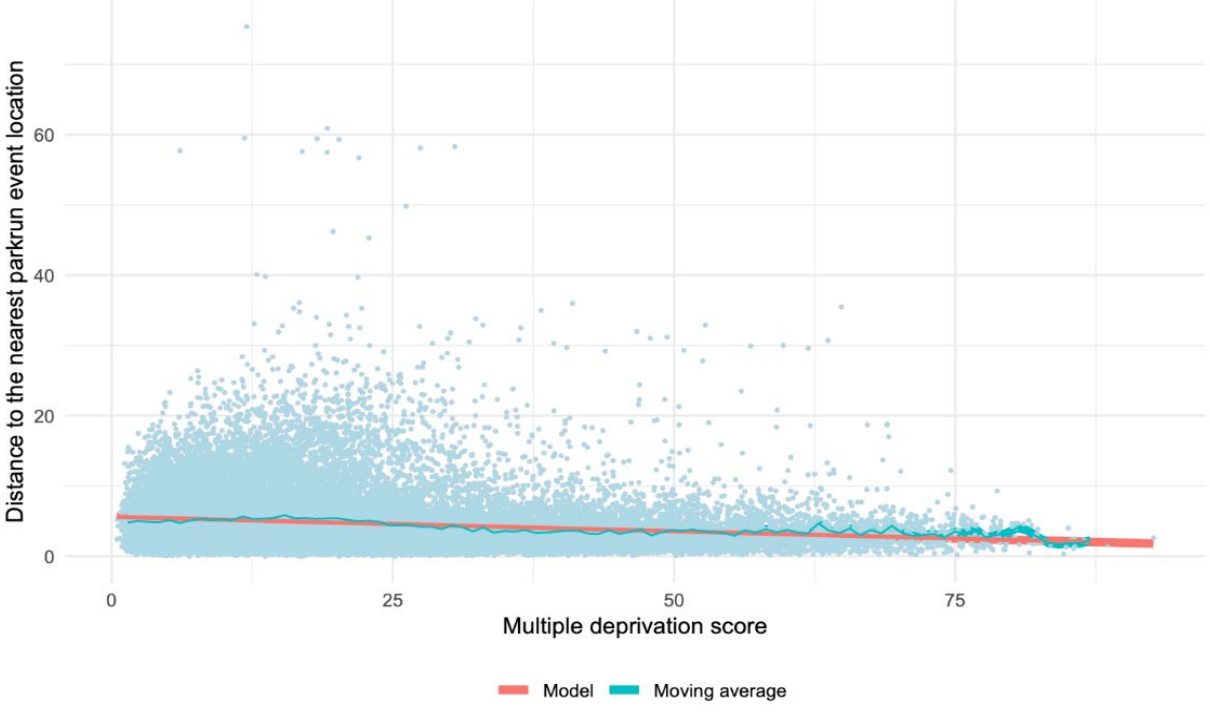
Results

1. How good is geographical access to parkrun?



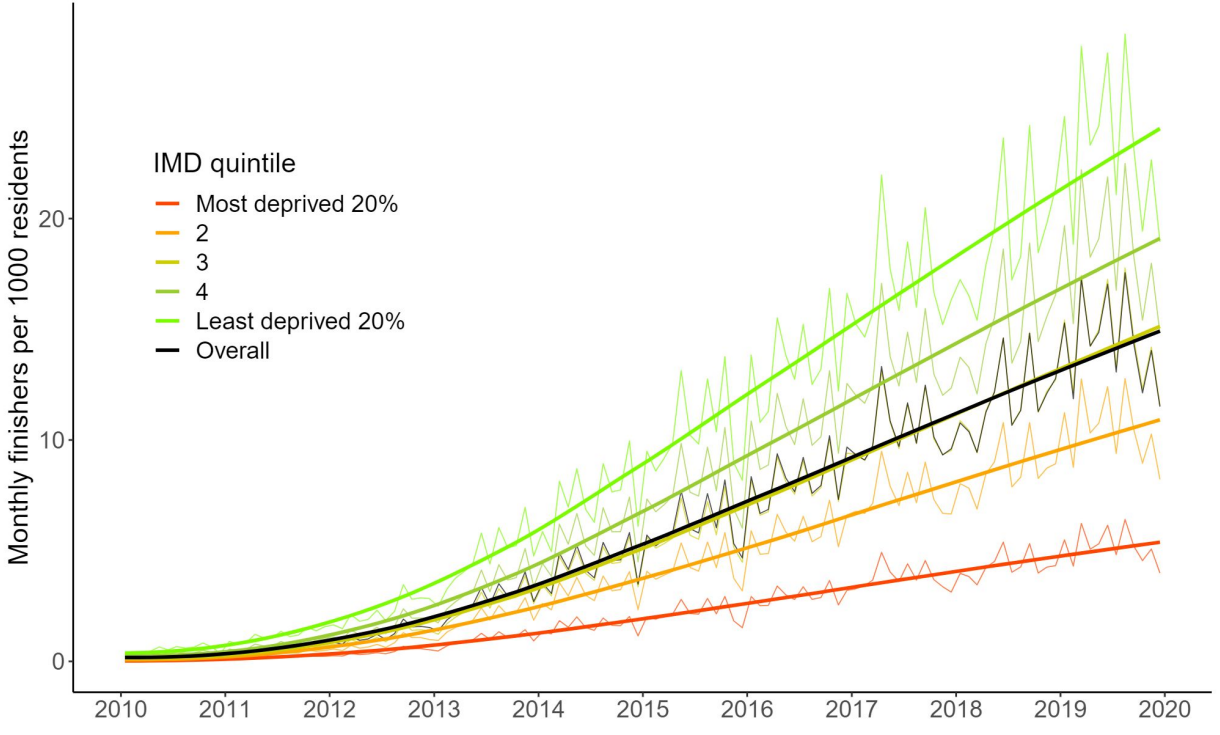
Results

2. How equitable is geographical access?



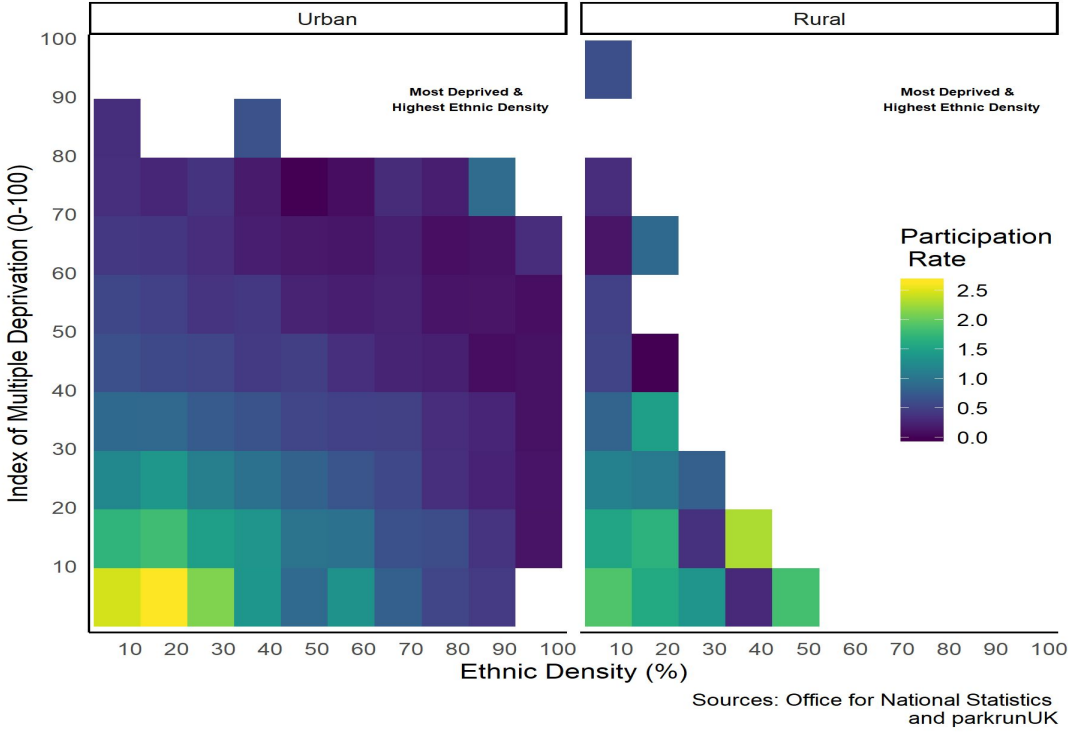
Results

3. How good is participation in parkrun?



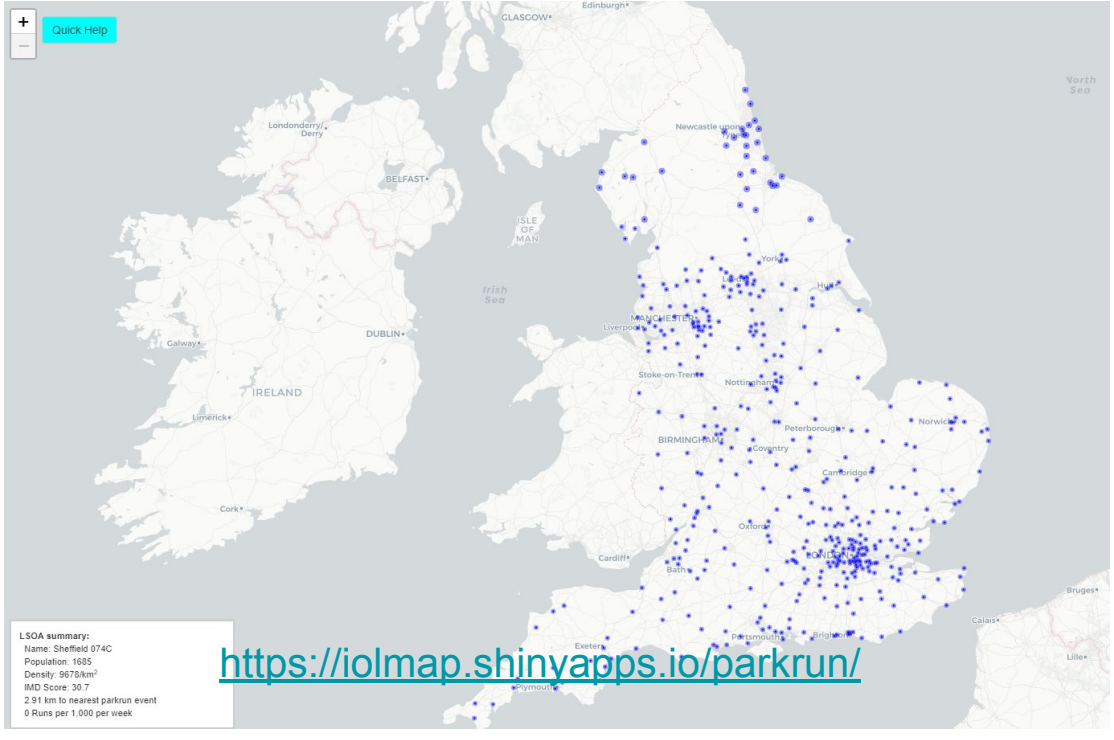
Results

4. How equitable is participation?



Results

Where should parkrun locate 200 new parkrun events?



https://iolmap.shinyapps.io/parkrun/

Publications

Smith, R.A., Schneider, P.P., Cosulich, R., Quirk, H., Bullas, A.M., Haake, S.J. and Goyder, E., 2021. Socioeconomic inequalities in distance to and participation in a community-based running and walking activity: A longitudinal ecological study of parkrun 2010 to 2019. Health & Place, 71, p.102626. https://doi.org/10.1016/j.healthplace.2021.102626

Schneider, P.P., Smith, R.A., Bullas, A.M., Bayley, T., Haake, S.S., Brennan, A. and Goyder, E. 2020. Multiple deprivation and geographic distance to community physical activity events — achieving equitable access to parkrun in England. Journal of Public Health. 48;53(189). https://doi.org/10.1016/j.puhe.2020.09.002

Smith, R., Schneider, P., Bullas, A., Haake, S., Quirk, H., Cosulich, R. and Goyder, E., 2020. Does ethnic density influence community participation in mass participation physical activity events? The case of parkrun in England. Wellcome Open Research, 5(9), p.9. https://doi.org/10.12688/wellcomeopenres.15657.2

Code

https://github.com/RobertASmith/parkrun_temporal

https://github.com/RobertASmith/DoPE_Public

https://github.com/RobertASmith/parkruntimeseries

https://github.com/ScHARR-PHEDS/iolmap_revision

https://github.com/ScHARR-PHEDS/parkrun_book

Reproduction & Impact

"Rob and colleague Dr. Paul Schneider developed a statistical tool (an algorithm) which searched through all of the greenspaces in England and ranked the top 200 by predicted public health impact.

One example of how the statistical tool was used is the creation of Bowling Park parkrun, located in a deprived area of Bradford. Our local Ambassador, working with community groups, identified the location as an option for a parkrun event – which was corroborated by Rob's work – and the event became a reality for the local people." (parkrunUK, 2020).

https://blog.parkrun.com/uk/2020/12/08/using-research-to-improve-inclusivity/

Thankyou

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